



Healthcare Standards Needs for Using the NII: An Application of the IISP Framework Method

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I. Introduction

The Standards Framework Management Group, Working Group 2 of the American National Standards Institute's (ANSI) Information Infrastructure Standards Panel (IISP) has implemented a method for identifying standards needed for the National Information Infrastructure (NII). The Framework Method is described in Framework for Identifying Requirements for Standards for the National Information Infrastructure [ANSI95]. The Framework is a 3-axis model which includes NII Services, Applications, and Interfaces. The cells where the three axes intersect contain statements of standards needed to support the particular Service/Application/Interface intersections. Services and Interfaces are being defined jointly by IISP participants. However, for the Application axis, each industry may have different needs. Therefore, several ad hoc groups were formed by various industries to analyze and represent industry-specific Application needs. The ad hoc group for health has been co-chaired by C. Peter Waegemann, Executive Director of the Medical Records Institute, and Susan Katz, the author of this paper. This paper documents the progress thus far of the analysis of the health Application axis and the standards needs identified for healthcare. Findings were presented at the January 1997 meeting of ANSI IISP WG2 [KATZ97]. The suggested needs statements have not yet gone through the consensus process, but are intended to serve as a starting point for further industry discussions and contributions.

Because the application axis for healthcare is so broad, a separate domain analysis was conducted of applications within the healthcare industry. Subsequently, domain analysis was conducted on the information technology services needed to support those healthcare applications. The findings of the analysis of services were contributed to the overall effort to define the NII Services axis. The Framework approach was used to analyze the interfaces and identify needed technology and requirements for standards. The use of these two new techniques (domain analysis and the Framework Method) in combination represents a new approach to analyzing complex requirements and may prove to be a valuable analytical tool as technical industries continue to become increasingly multi-disciplinary.

Healthcare services needs were discussed and incorporated into the generic Services axis being used by ANSI IISP WG2 [DABR97].

As a way of depicting the complexity of the health application area, the following outline of categories of healthcare standards was drafted:

Categories of Healthcare Standards

1. Information Exchange (shared with other industries)
 - 1.1 Electronic Data Interchange
 - 1.2 Network Protocols
 - 1.3 Security
 - 1.3.1 Access Control (e.g., role-based)
 - 1.3.2 Cryptography
 - 1.3.3 Risk Management
 - 1.3.4 Digital Signatures
 - 1.4 Database and Data Management (including Configuration Management)
 - 1.5 Graphics
 - 1.6 Language Processing (including syntax and semantics)
 - 1.6.1 Spoken
 - 1.6.2 Written (including Braille)
 - 1.6.3 Natural Language Understanding
 - 1.6.4 Translation
 - 1.7 Multi-media exchange
 - 1.8 Image processing
 - 1.8.1 Resolution
 - 1.8.2 Compression
 - 1.8.3 Transmission Accuracy
2. Information Content
 - 2.1 Format (class)
 - 2.1.1 Identifiers
 - 2.1.1.1 Patient
 - 2.1.1.2 Provider
 - 2.1.1.3 Provider Organization
 - 2.1.1.4 Payor Organization
 - 2.1.2 Computer-based Patient Records
 - 2.1.3 Practice Guidelines
 - 2.1.4 Claims
 - 2.1.5 Billing
 - 2.1.6 Clinical Reports
 - 2.1.7 Procurement Forms (for goods and services)

- 2.2 Codes (instances)
 - 2.2.1 Diagnosis (e.g., ICD, SNOMED)
 - 2.2.2 Procedures (e.g., CPT)
 - 2.2.3 Drugs (Rx and OTC)
 - 2.2.4 Toxins
 - 2.2.5 Anatomic Locations
 - 2.2.6 Units of Measure (including std proxy measurements)
 - 2.2.7 Symptoms
 - 2.2.8 Signs
 - 2.2.8.1 Clinical
 - 2.2.8.1.1 Interviewed
 - 2.2.8.1.1.1 History
 - 2.2.8.1.1.1.1 Patient
 - 2.2.8.1.1.1.2 Family
 - 2.2.8.1.1.1.3 Social
 - 2.2.8.1.1.2 Complaint Information
 - 2.2.8.1.1.3 Related Information (e.g., nutritional intake, other complaints)
 - 2.2.8.1.1.4 Structured Interview Tests (e.g., Beck Depression Inventory)
 - 2.2.8.1.2 Observed (through examination)
 - 2.2.8.2 Diagnostic Study
 - 2.2.8.2.1 Laboratory Data (specimens)
 - 2.2.8.2.2 Mechanical (Xray, EEG, EKG, CAT, MRI, etc.)
- 2.3 Quality Assurance
 - 2.3.1 Prevention Guidelines
 - 2.3.2 Practice Guidelines
 - 2.3.3 Standards for Conducting Clinical Trials
 - 2.3.4 Standards for Conducting Outcomes Studies
 - 2.3.5 Standards for Conducting Interview and Examination Surveys

II. Health Application Axis for the IISP Framework

The following breakdown of the health application area is based largely on the different of the groups providing the services and products listed. Although there may be some areas of overlap, the outline is presumed to be inclusive and therefore fairly complete. Following the domain analysis and the construction of this outline, each component of the outline was analyzed for its current status with regards to standards needed for optimal usage of the NII.

[A0] Healthcare

[A1] Population- based Health

- [A11] Assess lifestyle, risks, community health problems

[A12] Preventive Interventions

- [A121] Primary Intervention (promoting healthy lifestyles; educ; outreach)

- [A122] Secondary Intervention (improved screening for early detection)

- [A123] Tertiary Intervention (treatment of disease to limit its effect)

[A13] Evaluate Interventions

[A2] Public Health

- [A21] Manage environmental and infectious risks to public health

- [A22] Work with communities to develop supporting social structures

[A23] Policy-Making

- [A231] Gather Information

- [A232] Perform Comparisons

- [A233] Propose Changes

- [A234] Gather Promotional Data

- [A235] Disseminate Promotional Data

- [A236] Facilitate/Justify Legislative Changes

[A3] Provide Individual Healthcare

- [A31] Diagnose

- [A32] Treat

- [A33] Manage Patient Care

- [A34] Educate Patient

- [A35] Follow-up

[A4] Provide Supporting Services and Products

- [A41] Anesthesiology

- [A42] Radiology

- [A43] Pathology

- [A44] Laboratory Tests

- [A45] Pharmaceuticals

- [A5] Conduct Research
 - [A51] Formulate Hypothesis
 - [A52] Define Methods/ Set Standards
 - [A53] Select Sample
 - [A54] Conduct Study
 - [A55] Perform Statistical Processing and Analysis
 - [A56] Forumulate Conclusions
 - [A57] Publish/ Disseminate Findings
- [A6] Manage Resources
 - [A61] Financial
 - [A62] Personnel
 - [A63] Facilities
 - [A64] Products, Inventory and Equipment
- [A7] Provide Education
 - [A71] Population (broadcast msg)
 - [A72] Individuals (Patients) (custom msg)
 - [A73] Providers
 - [A74] Researchers
 - [A75] Public Health Officials
 - [A76] Legislators

III. Needs for New Standards

The standards needs statements in this section are in the format used by ANSI IISP WG2. Needs statements are listed that reference their source in the Application axis outline in Section II above. Needs statements are then listed that reference supporting services from the Generic Services axis [DABR97] and the Interfaces Axis. In the Impact Statements, cross-reference relationships to the Services and Interfaces axes are described, where known. Additional work will be required to complete the analysis using the Framework method.

Future contacts regarding the needs statements can be made to Christopher Dabrowski, member of ANSI IISP WG2, at:

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Information Technology Laboratory
820 W. Diamond Ave.
Gaithersburg, MD 20899

A. Needs Statements Referencing the Application Axis

A11:

Title of Need:	Usability of health encounter data for population health studies.
Scope of Need:	Domestic health issues.
Abstract/Description:	Standards are needed to ensure that massively collected healthcare encounter data can be used secondarily to assess population health. The required standards include security/privacy standards and format/content standards.
Impact Statement:	Without these standards, population assessment data are collected at great expense, raising taxes when done through public health departments and premiums when done through managed care organizations. Often, cost prohibits the gathering of what would be useful information. There exists today a wealth of data but a dearth of information because much of the data are not comparable or not accessible. Therefore, medicine is practiced without an optimal knowledge base.
Related Needs:	
Documentation References:	[KK96], [Thack], [Kilb], [Katz96]
Existing Work:	The implementation of the Administrative Simplification Act of 1994 [KK96] is dealing somewhat with this issue.
Date of Submission:	1997-04-21
Last Update:	1997-04-21

A21:

Title of Need:	Environmental/health data interface.
Scope of Need:	Domestic health issues.
Abstract/Description:	Standards are needed to ensure that environment-related data can be matched to appropriate health data relating to human health impact of the corresponding environmental risks.
Impact Statement:	Currently, many data collected for environmental impact purposes cannot be directly related to human health impact, resulting in regulations that necessarily err on the cautious side and are costly for industry to implement and for government to regulate. There is often little communication between departments of health and environment at federal, state and local levels, and databases are not linked such that regression/correlation analysis between health events and environmental factors can be performed and research appropriately directed to determine if causal links exist.
Related Needs:	
Documentation References:	
Existing Work:	
Date of Submission:	1997-04-21
Last Update:	1997-04-21

A31:

Title of Need: Timely availability of patient information during healthcare encounters.

Scope of Need: Domestic and global.

Abstract/Description: Quality of service standards [BREI87] are needed to ensure that needed information is available during patient encounters.

Impact Statement: Currently, an average of 22-38% of patient encounters are encumbered by one or more of the following problems:

- No medical history available
- No online eligibility determination
- Little or no data from recent tests
- Limited or no knowledge of drug allergies [WAE97]

Solving this problem would increase both quality and efficiency of care, and would also create a market for automated tools which would further the extent to which quality and efficiency could be improved. This need applies to all high-level and supporting Services. The relationship to the Interface axis has not yet been determined.

Related Needs:

Documentation References:

Existing Work:

Date of Submission: 1997-04-21

Last Update: 1997-04-21

A4:

Title of Need:	Reporting and assessment from supporting medical services data.
Scope of Need:	Domestic and global.
Abstract/Description:	Format standards and messaging standards are needed to allow population health assessments and automatic notification of potential emergencies from data routinely collected from supporting medical services (radiology, pharmacology, pathology, etc.)
Impact Statement:	Currently, laboratory data are among the most automated in the health field. However, consistent standards for formatting and transfer of these and other supporting medical data are needed if analysis is to be performed on the population of records.
Related Needs:	
Documentation References:	
Existing Work:	
Date of Submission:	1997-04-21
Last Update:	1997-04-21

B. Needs Statements Referencing the Generic Services Axis

These needs relate to supporting services from the Services axis including security services for healthcare..

1. Human Language Processing.

a. Spoken Language Processing.

Title of Need:	Spoken language processing.
Scope of Need:	National and global.
Abstract/Description:	Standards are needed for measuring quality of spoken language processing, including voice recognition, speech recognition and understanding, parsing, and sound production.
Impact Statement:	Without these standards, quality of medical records and healthcare decision-making may be compromised. These standards support mainly areas A3 and A4 of the healthcare application axis, and the Human Technology Interface of the Interface axis.
Related Needs:	
Documentation References:	
Existing Work:	
Date of Submission:	1997-04-21
Last Update:	1997-04-21

b. Written Language Processing.

Title of Need:	Written language processing.
Scope of Need:	National and global.
Abstract/Description:	Standards are needed for measuring quality of written language processing, including recognition, parsing, indexing and classification.
Impact Statement:	Without these standards, quality of medical records and healthcare decision-making may be compromised. These standards support mainly areas A3 and A4 of the healthcare application axis, and the Human Technology Interface of the Interface axis.
Related Needs:	
Documentation References:	
Existing Work:	
Date of Submission:	1997-04-21
Last Update:	1997-04-21

c. Natural Language Understanding

Title of Need: Natural language understanding.
Scope of Need: National and global.
Abstract/Description: Standards are needed for measuring quality of natural language understanding through use of artificial intelligence methods, whether the language is received through spoken or written means.
Impact Statement: Without these standards, quality of medical records and healthcare decision-making may be compromised. These standards support mainly areas A3 and A4 of the healthcare application axis. The Interface axis area where this need applies has not yet been determined.
Related Needs:
Documentation References:
Existing Work:
Date of Submission: 1997-04-21
Last Update: 1997-04-21

d. Human Language Translation

Title of Need: Human language translation.
Scope of Need: National and global.
Abstract/Description: Standards are needed for measuring quality of human language translation, e.g., Spanish to English, through use of artificial intelligence methods or other methods, whether the language is received/output through spoken or written means.
Impact Statement: Without these standards, quality of medical records and healthcare decision-making may be compromised. These standards support mainly areas A3 and A4 of the healthcare application axis, and the Human Technology Interface of the Interface axis.
Related Needs:
Documentation References:
Existing Work:
Date of Submission: 1997-04-21
Last Update: 1997-04-21

2. Graphics and Image Processing

Title of Need: Graphics and image processing.
Scope of Need: National and global.
Abstract/Description: Standards are needed for measuring quality of graphics and image resolution, capture accuracy, compression and decompression, and transmission.
Impact Statement: Without these standards, quality of medical records and healthcare decision-making may be compromised. These standards support mainly areas A3 and A4 of the healthcare application axis.
Related Needs:
Documentation References:
Existing Work:
Date of Submission: 1997-04-21
Last Update: 1997-04-21

Special Security Needs for Healthcare: (these needs relate to the Services axis components as noted)

1. Limits for level of detail to maintain confidentiality.

Title of Need: Limits for level of detail to maintain confidentiality.
Scope of Need: National.
Abstract/Description: Standards are needed to ensure that population-aggregated data are not revealed such that they unintentionally divulge health information on individuals included in the aggregate data.
Impact Statement: Without consistent ways of measuring levels of detail, standards and laws protecting individual privacy rights may be violated. For instance, in rural areas, a large geographic section may contain a small population, and by seeing the health information, an observer may be able to deduce which individual is being discussed.
Related Needs:
Documentation References:
Existing Work:
Date of Submission: 1997-04-21
Last Update: 1997-04-21

2. Unique identifiers and their allowed uses.

Title of Need:	Unique identifiers and their allowed uses.
Scope of Need:	National and global.
Abstract/Description:	Unique identifiers are needed for individuals, employers, payors, health plans, and health care providers.
Impact Statement:	Without standard identifiers, healthcare is not portable, and healthcare information is not comparable.
Related Needs:	
Documentation References:	This relates to A3 and A4 of the healthcare application axis, but also to security in the services axis.
Existing Work:	[KK96]
Date of Submission:	1997-04-21
Last Update:	1997-04-21

C. Needs Statements Referencing the Interface Axis

One need is currently identified based on the Human Technology Interface.

1. Response time and ease of use in critical clinical situations

Title of Need:	Response time and ease of use in critical clinical situations.
Scope of Need:	National and global.
Abstract/Description:	In emergency response situations or care delivery situations where life-critical emergencies may arise, standards are needed to ensure that response time, learning curve, and ergonomics of medical products are appropriate to the healthcare delivery environment. These products, including equipment and software, must support and optimize the delivery of care, and standards must ensure that they cannot be misused, misinterpreted or be in danger of interfering with medical care.
Impact Statement:	If response time, user-friendliness and learning curve are not adequate and appropriate for health care-givers, then information technology products will not be used in healthcare settings, or care may be compromised and lives and welfare of patients put at risk. These standards support mainly areas A3 and A4 of the healthcare application axis.
Related Needs:	
Documentation References:	
Existing Work:	
Date of Submission:	1997-04-21
Last Update:	1997-04-21

IV. Recommendations for Follow-up

Both the draft outline of the health application axis and the standards needs statements in this report are being provided as documentation of work up to this point. Much of the section addressing existing healthcare standards efforts could be filled in by reviewing the recent inventory of healthcare standards efforts completed by ANSI's Health Information Standards Board (HISB) chaired by Peter Waagemann, and translated into IISP standards needs statements format. Both the section addressing existing standards efforts and the section addressing standards needs should be further reviewed and expanded by a broader set of participants. The participants and reviewers should include representatives from current healthcare standards efforts, healthcare service providers, manufacturers and adjunct service providers related to the healthcare industry, insurance companies, health maintenance organizations, healthcare cooperatives and conglomerates, public health officials, medical librarians, epidemiologists and academics.

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